# APPENDIX C

# HYDROLOGY STUDY

# ONSITE
# HYDROLOGY REPORT

## FOR

## LONG BEACH SPORTS PARK
### Long Beach, California

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# Long Beach Sports Park

## ONSITE HYDROLOGY REPORT

### Introduction

This report provides onsite hydrology calculations to support the design of storm drain systems to serve the Long Beach Sports Park development in the City of Long Beach. The development is generally bounded on the north by Spring Street, on the east by Orange Avenue, on the west by California Avenue and on the south by two existing cemetery sites. The improvement site covers about 55 acres. The location is shown on the vicinity map.

This report only covers onsite hydrology. Offsite hydrology is per an LACDPW memo dated April 30, 1992, from Richard Smith to Donald Nichols. A copy of this memo is included in Appendix C.

### Hydrology

Hydrology calculations were based on the Modified Rational Method as presented in the Los Angeles County Department of Public Works "Hydrology/Sedimentation Manual", dated December 1991, and "Addendum to the 1991 Hydrology/Sedimentation Manual", dated June 2002. The calculations were performed using the Time of Concentration Calculator developed by Los Angeles County Department of Public Works Water Resources Division.

Since the proposed Long Beach Sports Park site is to contain a detention basin, calculations were performed for a 50-year, 25-year and 10-year storm frequencies consistent with the LACDPW manual using MORA software. The 5-year and 2-year discharges were determined using factors 0.584 and 0.387 respectively as provided by LACDPW. As shown on the hydrologic soils map, the majority of the site falls within Soil Classification Area 013 with a couple areas to the south in Area 014. As shown on the isohyet map, the 50-Year 24-Hour Isohyet is 5.2.

### Existing Conditions

The site presently drains, primarily by surface flow, to seven separate sump areas (none of which are picked up by a storm drain) and an existing detention basin located onsite. A portion of the eastern part of the site drains to Orange Avenue (Sub areas 10A and 14A), while a portion of the western part of the site drains to California Avenue (Sub area 6A and 11A). Presently, there is a 78-inch storm drain (Walnut-Spring Drain, Unit 1) and a 69-inch storm drain (LBWD Drawing No. B-2035a and c) that gather storm flows from 207 acres offsite and convey the total flow of 460 cfs to an existing 108-inch storm drain (Walnut-Spring Drain, Unit 2) that runs through the northern half of the site and

discharges into the detention basin. All flows up to 100 cfs drain out of the detention basin through an existing 54-inch storm drain (LACFCD Project No. 5109). The remaining flows, combined with direct rainfall over the basin (Sub area 8A) and flow from the east (Sub area 9A) total 473 cfs with an equivalent storage volume of 36.07 acre-feet. All flows in excess of 100 cfs are stored in the basin and/or onsite until capacity in the downstream storm drain (Project No. 5109) is available. Detailed existing hydrology calculations are included in Appendix A.

## Proposed Conditions

Due to grading operations, the existing storm drains will be removed and a new 108-inch storm drain will be constructed downstream of Spring Street to carry and discharge the existing pipe flow of 460 cfs into a proposed 0.08-acre stilling basin area with a floor elevation of 44.5. The stilling basin will incorporate a 51-inch storm drain outlet with an invert elevation of 48.98. The storage volume in the stilling basin below the outlet is 0.52 acre-feet. The total storage volume of the stilling basin up to the access road is 1.66 acre-feet. The total flow discharged out of the stilling basin by the 51-inch storm drain will be 100 cfs. Flows in excess of 100 cfs will spill out of the stilling basin and into the soccer fields that act as a detention basin. The soccer field detention basin will have a total volume of 42.5 acre-feet.

The proposed site was broken into eleven drainage areas. Sub areas 1A through 9A are collected upstream of the proposed desilting basin. Areas 10A and 11A are collected into the 51-inch storm drain downstream of the desilting basin. The 51-inch storm drain discharges into the existing 54-inch RCP at the southwest corner of the site. Detailed hydrology calculations are included in Appendix B.

## Storm Water Management Plan

As required by the Standard Urban Storm Water Mitigation Plan (SUSMP) for Los Angeles County and the City of Long Beach Municipal Code Chapter 18.95, developments that will result in 100,000 square feet or more of impermeable surface, including parking lots, are subject to specific source control and treatment control best management practice (BMP) requirements. The project shall incorporate BMPs applicable to the site into its description and design that address pollutants of concern such as trash and petroleum hydrocarbons.

## Dry Weather Flow

Dry weather flow is defined as surface water runoff from non-storm events (excess landscape irrigation, washing off of sidewalks, street cleaning activities, etc.). All dry weather flows generated onsite are expected to be contained onsite. Runoff from all significant hardscape areas will be picked up by the proposed onsite storm drain system and discharged into the 108" storm drain upstream of the stilling basin. The stilling basin has a capacity of 0.52 acre-feet below the outlet elevation. This capacity will allow the dry weather flows to be contained onsite and percolate into the ground. Site areas

downstream of the stilling basin are predominately soccer fields or golf oriented areas. By controlling irrigation activities dry weather flows will be eliminated from these areas.

# APPENDIX A

# EXISTING HYDROLOGY CALCULATIONS
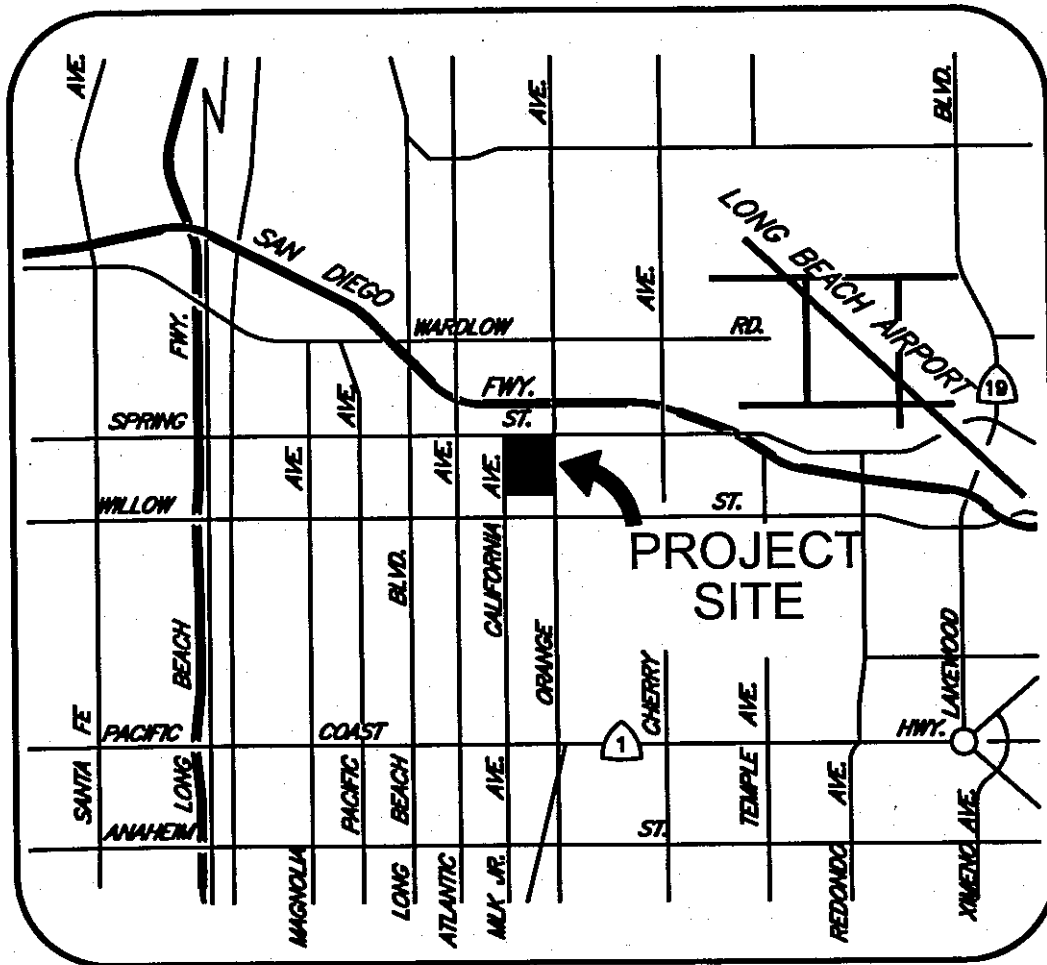
# VICINITY MAP
## N.T.S.

PROJECT
SITE

LONG BEACH
SPORTS PARK

33°52'30"

118° 15'

009

013

009

013

DPA-6

013

013

013

TORRANCE   1-H1.4

006

008

013

009

014

013

003

017

**PROJECT
LOCATION**

LOS ALAMITOS   1-H1.6

118°07'30"

33°45'



---

## LEGEND

— — — — SOIL CLASSIFICATION AREA          (K)     RAINFALL ZONE

· · · · · · · · DEBRIS POTENTIAL AREA          —12—    50-YEAR ISOHYET
                                                       (MAX. 24-HOUR AMOUNT)

# L A C D P W

N

**LONG BEACH**                    **1981**

0     FEET     5000

*hydrologic map*

33° 52' 30"

-118° 15' 00"

6.2
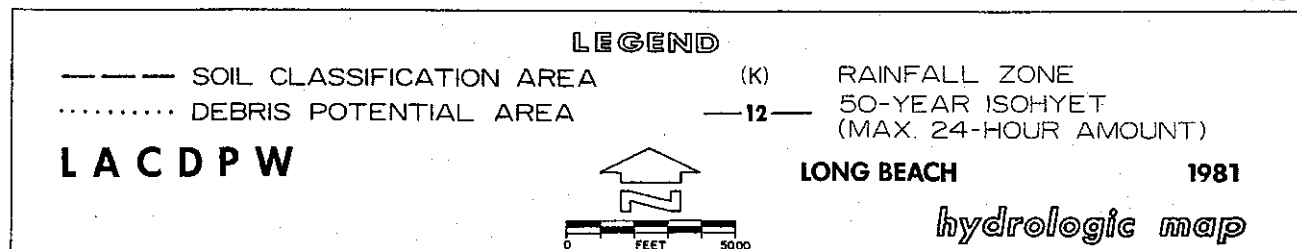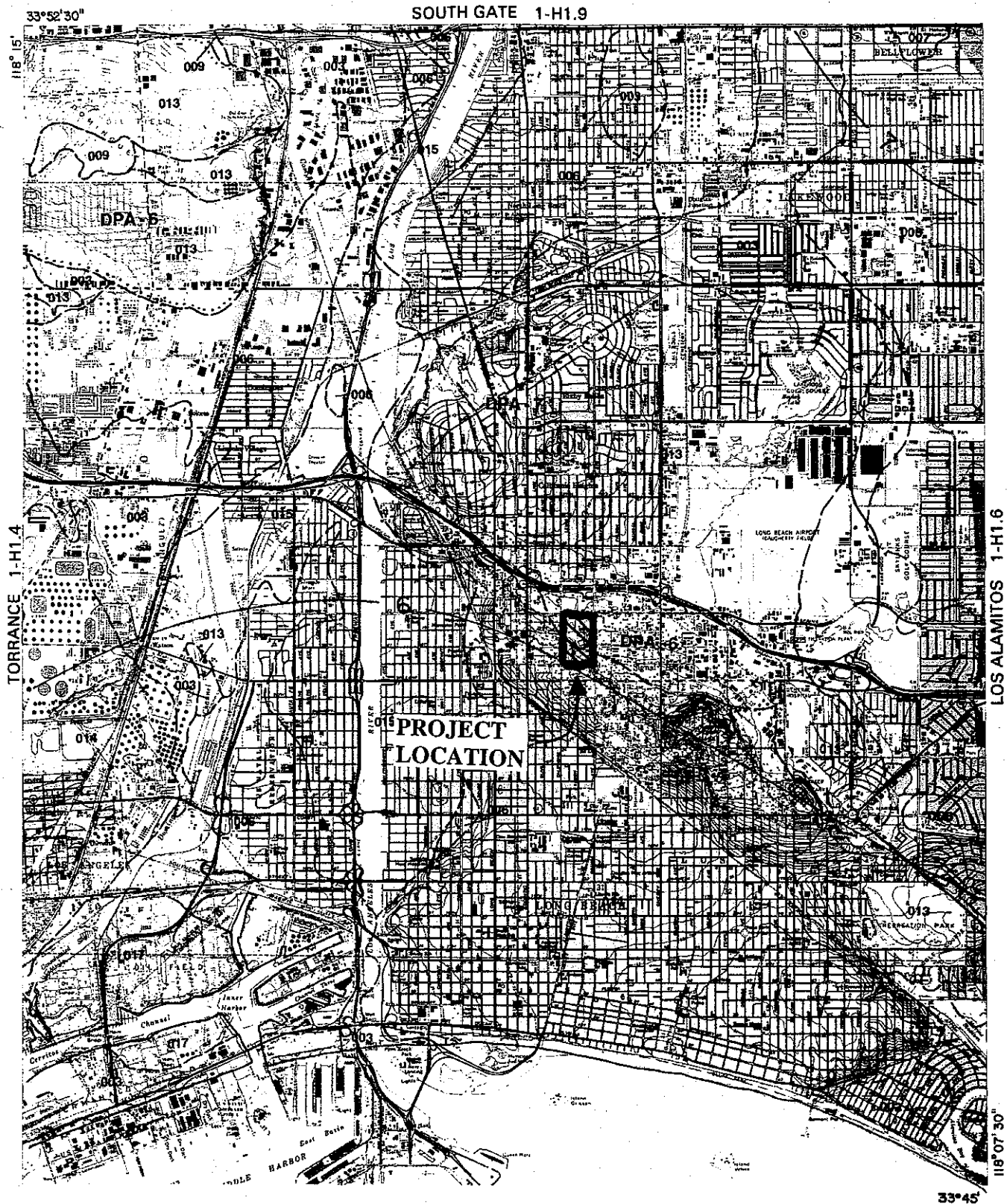
6.0

TORRANCE 1-H1.4

LOS ALAMITOS 1-H1.6

PROJECT
LOCATION

5.8
5.6
5.4
5.2
5.0
4.8
4.6

-118° 07' 30"

33° 43' 30"



| 1 | 0 | 1 | 2 Miles |

**N**
**W** ✦ **E**
**S**
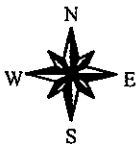
7.2 ⌒ INCHES OF
RAINFALL

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

**LONG BEACH**
**50-YEAR 24-HOUR ISOHYET**

**1-H1.5**

LOS ANGELES COUNTY
PUBLIC WORKS
Public Service That Works

## APPENDIX E: Proportion Impervious Values

### *Residential*

| | |
|---|---|
| Single-Family | 0.418 |
| Two-Unit | 0.418 |
| Three-Unit | 0.682 |
| Four-Unit | 0.819 |
| Five-Unit | 0.855 |

### *Commercial*

| | |
|---|---|
| Stores, Office Buildings, Manufacturing Outlets | 0.909 |
| Shopping Centers (Regional), Restaurants, Service Shops, Auto Equipment, Parking Lots | 0.946 |
| Shopping Centers (Neighborhood), Motels, Hotels, Kennels, Professional Buildings, Banks, Service Stations | 0.958 |
| Supermarkets | 0.976 |
| Department Stores | 0.985 |

### *Industrial*

| | |
|---|---|
| Mineral Processing | 0.473 |
| Open Storage | 0.655 |
| Motion Picture, Radio, Television | 0.819 |
| Manufacturing, Warehousing, Storage, Parking | 0.909 |
| Food Processing Plants, Lumber Yards | 0.958 |

### *Institutional Property*

| | |
|---|---|
| Colleges, Universities | 0.473 |
| Homes for the Aged | 0.682 |
| Hospitals, Cemeteries, Mausoleums, Mortuaries | 0.744 |
| Churches, Schools | 0.819 |

### *Undeveloped Property*

| | |
|---|---|
| Rural | 0.01 |

| AREA | LAND COVER | | %IMP | %IMP | 2-YR | 5-YR | 10-YR | 25-YR | 50-YR |
|---|---|---|---|---|---|---|---|---|---|
| | **LONG BEACH SPORTS COMPLEX HYDROLOGY** | | | | | | | | |
| | **EXISTING FLOWS** | | | | | | | | |
| 1a | 60% | Parking Lot | 0.946 | 0.572 | 2 | 3 | 5 | 7 | 9 |
| | 40% | Rural | 0.01 | | | | | | |
| 2a | 100% | Rural | 0.01 | 0.010 | 0 | 1 | 2 | 3 | 3 |
| 3a | 10% | Parking Lot | 0.946 | 0.463 | 5 | 13 | 18 | 28 | 35 |
| | 40% | Warehousing | 0.909 | | | | | | |
| | 50% | Rural | 0.01 | | | | | | |
| 4a | 80% | Manufacturing | 0.909 | 0.729 | 1 | 2 | 2 | 3 | 4 |
| | 20% | Rural | 0.01 | | | | | | |
| 5a | 100% | Rural | 0.01 | 0.010 | 0 | 1 | 1 | 1 | 1 |
| 6a | 100% | Rural | 0.01 | 0.010 | 0 | 0 | 1 | 1 | 2 |
| 7a | 10% | Concrete (Storage) | 0.909 | 0.100 | 1 | 5 | 8 | 16 | 20 |
| | 90% | Rural | 0.01 | | | | | | |
| 8a | 100% | Rural | 0.01 | 0.010 | 0 | 1 | 2 | 2 | 3 |
| 9a | 10% | Manufacturing | 0.909 | 0.100 | 0 | 3 | 5 | 8 | 10 |
| | 90% | Rural | 0.01 | | | | | | |
| 10a | 80% | Manufacturing | 0.909 | 0.729 | 0 | 1 | 1 | 1 | 1 |
| | 20% | Rural | 0.01 | | | | | | |
| 11a | 100% | Rural | 0.01 | 0.010 | 0 | 1 | 1 | 2 | 2 |
| 12a | 100% | Rural | 0.01 | 0.010 | 0 | 0 | 1 | 2 | 2 |
| 13a | 10% | Storage | 0.909 | 0.100 | 1 | 1 | 3 | 8 | 13 |
| | 90% | Rural | 0.01 | | | | | | |
| 14a | 30% | Manufacturing | 0.909 | 0.973 | 1 | 2 | 3 | 5 | 7 |
| | 70 | Rural | 0.01 | | | | | | |

## LONG BEACH SPORTS PARK EXISTING 50-YR HYDROLOGY

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 590050 | 1a | 3.44 | 0.572 | 50 | 13 | 481.36 | 0.0233 | 5.2 | 6 | 2.85 | 0.9 | 0.9 | 9 |
| 590050 | 2a | 1.08 | 0.01 | 50 | 13 | 246.7 | 0.0451 | 5.2 | 5 | 3.1 | 0.91 | 0.9 | 3 |
| 590050 | 3a | 15.95 | 0.463 | 50 | 13 | 818.26 | 0.035 | 5.2 | 8 | 2.49 | 0.88 | 0.89 | 35 |
| 590050 | 4a | 1.65 | 0.729 | 50 | 13 | 574.94 | 0.0218 | 5.2 | 7 | 2.65 | 0.89 | 0.9 | 4 |
| 590050 | 5a | 0.52 | 0.01 | 50 | 13 | 118 | 0.1 | 5.2 | 5 | 3.1 | 0.91 | 0.9 | 1 |
| 590050 | 6a | 0.88 | 0.01 | 50 | 14 | 471.23 | 0.0525 | 5.2 | 7 | 2.65 | 0.7 | 0.7 | 2 |
| 590050 | 7a | 10.63 | 0.1 | 50 | 14 | 591.66 | 0.0841 | 5.2 | 7 | 2.65 | 0.7 | 0.72 | 20 |
| 590050 | 8a | 0.97 | 0.01 | 50 | 13 | 194.79 | 0.2116 | 5.2 | 5 | 3.1 | 0.91 | 0.9 | 3 |
| 590050 | 9a | 4.06 | 0.1 | 50 | 13 | 729.84 | 0.1058 | 5.2 | 6 | 2.85 | 0.9 | 0.9 | 10 |
| 590050 | 10a | 0.47 | 0.729 | 50 | 13 | 362.83 | 0.0155 | 5.2 | 6 | 2.85 | 0.9 | 0.9 | 1 |
| 590050 | 11a | 0.91 | 0.01 | 50 | 14 | 108.83 | 0.1167 | 5.2 | 5 | 3.1 | 0.74 | 0.74 | 2 |
| 590050 | 12a | 1.14 | 0.01 | 50 | 14 | 402.87 | 0.0242 | 5.2 | 7 | 2.65 | 0.7 | 0.7 | 2 |
| 590050 | 13a | 10.67 | 0.1 | 50 | 14 | 1385.53 | 0.0495 | 5.2 | 14 | 1.91 | 0.6 | 0.63 | 13 |
| 590050 | 14a | 3.59 | 0.28 | 50 | 14 | 686.91 | 0.0518 | 5.2 | 8 | 2.49 | 0.69 | 0.75 | 7 |

## LONG BEACH SPORTS PARK EXISTING 25-YR HYDROLOGY

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (cfs) |
|---------|---------|--------------|------|-----------|-----------|-------------|---------------|---------------|----------------------|--------------------|------|------|----------------|
| 590050 | 1a | 3.44 | 0.572 | 25 | 13 | 481.36 | 0.0233 | 4.57 | 7 | 2.33 | 0.87 | 0.89 | 7 |
| 590050 | 2a | 1.08 | 0.01 | 25 | 13 | 246.7 | 0.0451 | 4.57 | 5 | 2.73 | 0.89 | 0.89 | 3 |
| 590050 | 3a | 15.95 | 0.463 | 25 | 13 | 818.26 | 0.035 | 4.57 | 9 | 2.07 | 0.82 | 0.86 | 28 |
| 590050 | 4a | 1.65 | 0.729 | 25 | 13 | 574.94 | 0.0218 | 4.57 | 8 | 2.19 | 0.84 | 0.88 | 3 |
| 590050 | 5a | 0.52 | 0.01 | 25 | 13 | 118 | 0.1 | 4.57 | 5 | 2.73 | 0.89 | 0.89 | 1 |
| 590050 | 6a | 0.88 | 0.01 | 25 | 14 | 471.23 | 0.0525 | 4.57 | 7 | 2.33 | 0.68 | 0.68 | 1 |
| 590050 | 7a | 10.63 | 0.1 | 25 | 14 | 591.66 | 0.0841 | 4.57 | 8 | 2.19 | 0.65 | 0.68 | 16 |
| 590050 | 8a | 0.97 | 0.01 | 25 | 13 | 194.79 | 0.2116 | 4.57 | 5 | 2.73 | 0.89 | 0.89 | 2 |
| 590050 | 9a | 4.06 | 0.1 | 25 | 13 | 729.84 | 0.1058 | 4.57 | 7 | 2.33 | 0.87 | 0.87 | 8 |
| 590050 | 10a | 0.47 | 0.729 | 25 | 13 | 362.83 | 0.0155 | 4.57 | 6 | 2.5 | 0.88 | 0.89 | 1 |
| 590050 | 11a | 0.91 | 0.01 | 25 | 14 | 108.83 | 0.1167 | 4.57 | 5 | 2.73 | 0.71 | 0.71 | 2 |
| 590050 | 12a | 1.14 | 0.01 | 25 | 14 | 402.87 | 0.0242 | 4.57 | 8 | 2.19 | 0.65 | 0.65 | 2 |
| 590050 | 13a | 10.67 | 0.1 | 25 | 14 | 1385.53 | 0.0495 | 4.57 | 17 | 1.53 | 0.48 | 0.52 | 8 |
| 590050 | 14a | 3.59 | 0.28 | 25 | 14 | 686.91 | 0.0518 | 4.57 | 9 | 2.07 | 0.64 | 0.71 | 5 |

## LONG BEACH SPORTS PARK EXISTING 10-YR HYDROLOGY

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 590050 | 1a | 3.44 | 0.572 | 10 | 13 | 481.36 | 0.0233 | 3.71 | 9 | 1.68 | 0.71 | 0.82 | 5 |
| 590050 | 2a | 1.08 | 0.01 | 10 | 13 | 246.7 | 0.0451 | 3.71 | 5 | 2.21 | 0.85 | 0.85 | 2 |
| 590050 | 3a | 15.95 | 0.463 | 10 | 13 | 818.26 | 0.035 | 3.71 | 12 | 1.47 | 0.65 | 0.77 | 18 |
| 590050 | 4a | 1.65 | 0.729 | 10 | 13 | 574.94 | 0.0218 | 3.71 | 10 | 1.6 | 0.69 | 0.84 | 2 |
| 590050 | 5a | 0.52 | 0.01 | 10 | 13 | 118 | 0.1 | 3.71 | 5 | 2.21 | 0.85 | 0.85 | 1 |
| 590050 | 6a | 0.88 | 0.01 | 10 | 14 | 471.23 | 0.0525 | 3.71 | 11 | 1.53 | 0.48 | 0.48 | 1 |
| 590050 | 7a | 10.63 | 0.1 | 10 | 14 | 591.66 | 0.0841 | 3.71 | 11 | 1.53 | 0.48 | 0.52 | 8 |
| 590050 | 8a | 0.97 | 0.01 | 10 | 13 | 194.79 | 0.2116 | 3.71 | 5 | 2.21 | 0.85 | 0.85 | 2 |
| 590050 | 9a | 4.06 | 0.1 | 10 | 13 | 729.84 | 0.1058 | 3.71 | 9 | 1.68 | 0.71 | 0.73 | 5 |
| 590050 | 10a | 0.47 | 0.729 | 10 | 13 | 362.83 | 0.0155 | 3.71 | 7 | 1.89 | 0.78 | 0.87 | 1 |
| 590050 | 11a | 0.91 | 0.01 | 10 | 14 | 108.83 | 0.1167 | 3.71 | 5 | 2.21 | 0.66 | 0.66 | 1 |
| 590050 | 12a | 1.14 | 0.01 | 10 | 14 | 402.87 | 0.0242 | 3.71 | 11 | 1.53 | 0.48 | 0.48 | 1 |
| 590050 | 13a | 10.67 | 0.1 | 10 | 14 | 1385.53 | 0.0495 | 3.71 | 29 | 0.97 | 0.23 | 0.3 | 3 |
| 590050 | 14a | 3.59 | 0.28 | 10 | 14 | 686.91 | 0.0518 | 3.71 | 12 | 1.47 | 0.47 | 0.59 | 3 |

## LONG BEACH SPORTS PARK EXISTING 2-YR HYDROLOGY

EXISTING 2-YR

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flowrate (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 590050 | 1a | 3.44 | 0.572 | 2 | 13 | 481.36 | 0.0233 | 2.01 | 15 | 0.72 | 0.33 | 0.66 | 2 |
| 590050 | 2a | 1.08 | 0.01 | 2 | 13 | 246.7 | 0.0451 | 2.01 | 13 | 0.77 | 0.36 | 0.37 | 0 |
| 590050 | 3a | 15.95 | 0.463 | 2 | 13 | 818.26 | 0.035 | 2.01 | 23 | 0.59 | 0.21 | 0.53 | 5 |
| 590050 | 4a | 1.65 | 0.729 | 2 | 13 | 574.94 | 0.0218 | 2.01 | 16 | 0.69 | 0.31 | 0.74 | 1 |
| 590050 | 5a | 0.52 | 0.01 | 2 | 13 | 118 | 0.1 | 2.01 | 6 | 1.1 | 0.53 | 0.53 | 0 |
| 590050 | 6a | 0.88 | 0.01 | 2 | 14 | 471.23 | 0.0525 | 2.01 | 30 | 0.52 | 0.1 | 0.11 | 0 |
| 590050 | 7a | 10.63 | 0.1 | 2 | 14 | 591.66 | 0.0841 | 2.01 | 30 | 0.52 | 0.1 | 0.18 | 1 |
| 590050 | 8a | 0.97 | 0.01 | 2 | 13 | 194.79 | 0.2116 | 2.01 | 7 | 1.02 | 0.5 | 0.5 | 0 |
| 590050 | 9a | 4.06 | 0.1 | 2 | 13 | 729.84 | 0.1058 | 2.01 | 30 | 0.52 | 0.12 | 0.2 | 0 |
| 590050 | 10a | 0.47 | 0.729 | 2 | 13 | 362.83 | 0.0155 | 2.01 | 12 | 0.79 | 0.37 | 0.76 | 0 |
| 590050 | 11a | 0.91 | 0.01 | 2 | 14 | 108.83 | 0.1167 | 2.01 | 15 | 0.72 | 0.1 | 0.11 | 0 |
| 590050 | 12a | 1.14 | 0.01 | 2 | 14 | 402.87 | 0.0242 | 2.01 | 30 | 0.52 | 0.1 | 0.11 | 0 |
| 590050 | 13a | 10.67 | 0.1 | 2 | 14 | 1385.53 | 0.0495 | 2.01 | 30 | 0.52 | 0.1 | 0.18 | 1 |
| 590050 | 14a | 3.59 | 0.28 | 2 | 14 | 686.91 | 0.0518 | 2.01 | 27 | 0.54 | 0.1 | 0.32 | 1 |

# APPENDIX B

# PROPOSED HYDROLOGY CALCULATIONS

| SUB AREA | AREA (AC) | COMPOS % IMPER. | SOIL TYPE | L (FT) | U/S ELEV | D/S ELEV | SLOPE | 50 YR TC | I50 IN/HR | CU | CD | Q50 (CFS) | Q25 (CFS) | Q10 (CFS) | *Q5 (CFS) | *Q2 (CFS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1A | 6.08 | 0.10 | 13 | 640 | 100 | 87 | .020 | 8 | 2.51 | 0.88 | 0.88 | 13 | 11 | 9 | 8 | 5 |
| 2A | 3.23 | 0.10 | 13 | 370 | 95 | 85 | .027 | 5 | 3.11 | 0.91 | 0.90 | 9 | 8 | 6 | 5 | 4 |
| 3A | 2.86 | 0.73 | 13 | 560 | 95 | 93 | .004 | 10 | 2.25 | 0.85 | 0.89 | 6 | 6 | 5 | 4 | 2 |
| 4A | 3.42 | 0.10 | 13 | 460 | 95 | 84 | .024 | 6 | 2.88 | 0.90 | 0.90 | 10 | 9 | 7 | 6 | 4 |
| 5A | 272 | 0.10 | 13 | 370 | 95 | 85 | .027 | 5 | 3.10 | 0.91 | 0.90 | 9 | 8 | 6 | 5 | 4 |
| 6A | 5.14 | 0.46 | 13 | 470 | 95 | 84 | .023 | 6 | 2.85 | 0.90 | 0.90 | 13 | 12 | 9 | 8 | 5 |
| 7A | 3.37 | 0.10 | 13 | 380 | 95 | 84 | .029 | 5 | 3.14 | 0.91 | 0.90 | 9 | 8 | 6 | 5 | 4 |
| 8A | 8.70 | 0.85 | 13 | 600 | 105 | 83 | .037 | 7 | 2.64 | 0.89 | 0.90 | 23 | 20 | 17 | 13 | 9 |
| 9A | 2.82 | 0.10 | 14 | 600 | 70 | 45 | .042 | 8 | 2.49 | 0.69 | 0.71 | 5 | 4 | 3 | 3 | 2 |
| 10A | 5.23 | 0.06 | 14 | 500 | 125 | 95 | .060 | 7 | 2.64 | 0.70 | 0.71 | 10 | 8 | 6 | 6 | 4 |
| 11A | 9.50 | 0.01 | 14 | 760 | 66 | 45 | .028 | 10 | 2.24 | 0.66 | 0.66 | 15 | 12 | 9 | 9 | 6 |

Note: Q5 and Q2 discharge determined by factors provided by LACDPW

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

LONG BEACH SPORTS PARK - 50-YEAR DISCHARGES   TALLEY 3/19/04                                          STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 1A | 6. | 13. | 6. | 13. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 8 | A26 | 0.10 |
| 59 | 2A | 3. | 9. | 9. | 22. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A26 | 0.10 |
| 59 | 3A | 3. | 6. | 12. | 28. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 10 | A26 | 0.73 |
| 59 | 4A | 4. | 10. | 16. | 39. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A26 | 0.10 |
| 59 | 5A | 3. | 9. | 19. | 47. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A26 | 0.10 |
| 59 | 6A | 5. | 13. | 24. | 61. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A26 | 0.46 |
| 59 | 7A | 3. | 9. | 27. | 69. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A26 | 0.10 |
| 59 | 8A | 9. | 23. | 36. | 92. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 7 | A26 | 0.85 |
| 59 | 9A | 3. | 5. | 39. | 98. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 8 | A26 | 0.10 |
| 59 | 10A | 5. | 10. | 44. | 107. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 7 | A26 | 0.06 |
| 59 | 11A | 10. | 15. | 54. | 122. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 10 | A26 | 0.01 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

END OF CALCULATION

HYDROGRAPH AT    59   11A          STORM DAY 4          REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0. | 100 | 2. | 200 | 2. | 300 | 2. | 400 | 3. |
| 500 | 3. | 600 | 3. | 700 | 3. | 800 | 4. | 900 | 4. |
| 1000 | 5. | 1050 | 6. | 1100 | 8. | 1110 | 10. | 1120 | 12. |
| 1130 | 16. | 1131 | 16. | 1132 | 17. | 1133 | 17. | 1134 | 18. |
| 1135 | 19. | 1136 | 19. | 1137 | 20. | 1138 | 21. | 1139 | 22. |
| 1140 | 23. | 1141 | 24. | 1142 | 26. | 1143 | 28. | 1144 | 30. |
| 1145 | 34. | 1146 | 38. | 1147 | 41. | 1148 | 44. | 1149 | 61. |
| 1150 | 77. | 1151 | 93. | 1152 | 107. | 1153 | 122. | 1154 | 119. |
| 1155 | 110. | 1156 | 96. | 1157 | 80. | 1158 | 63. | 1159 | 47. |
| 1160 | 34. | 1161 | 25. | 1162 | 20. | 1163 | 15. | 1164 | 13. |
| 1165 | 12. | 1166 | 11. | 1167 | 10. | 1168 | 10. | 1169 | 9. |
| 1170 | 9. | 1171 | 9. | 1172 | 8. | 1173 | 8. | 1174 | 8. |
| 1175 | 8. | 1176 | 8. | 1177 | 7. | 1178 | 7. | 1179 | 7. |
| 1180 | 7. | 1181 | 7. | 1182 | 7. | 1183 | 6. | 1184 | 6. |
| 1185 | 6. | 1186 | 6. | 1187 | 6. | 1188 | 6. | 1189 | 6. |
| 1190 | 6. | 1191 | 6. | 1192 | 6. | 1193 | 6. | 1194 | 6. |
| 1195 | 6. | 1196 | 5. | 1197 | 5. | 1198 | 5. | 1199 | 5. |
| 1200 | 5. | 1201 | 5. | 1202 | 5. | 1203 | 5. | 1204 | 5. |
| 1205 | 5. | 1206 | 5. | 1207 | 5. | 1208 | 5. | 1209 | 5. |
| 1210 | 5. | 1211 | 5. | 1212 | 5. | 1213 | 5. | 1214 | 5. |
| 1215 | 5. | 1216 | 5. | 1217 | 4. | 1218 | 4. | 1219 | 4. |
| 1220 | 4. | 1221 | 4. | 1222 | 4. | 1223 | 4. | 1224 | 4. |
| 1225 | 4. | 1226 | 4. | 1227 | 4. | 1228 | 4. | 1229 | 4. |
| 1230 | 4. | 1231 | 4. | 1232 | 4. | 1233 | 4. | 1234 | 4. |
| 1235 | 4. | 1236 | 4. | 1237 | 4. | 1238 | 4. | 1239 | 4. |
| 1240 | 4. | 1241 | 4. | 1242 | 4. | 1243 | 4. | 1244 | 4. |
| 1245 | 4. | 1246 | 4. | 1247 | 4. | 1248 | 4. | 1249 | 4. |
| 1250 | 4. | 1251 | 4. | 1252 | 4. | 1253 | 4. | 1254 | 4. |
| 1255 | 4. | 1256 | 3. | 1257 | 3. | 1258 | 3. | 1259 | 3. |
| 1260 | 3. | 1261 | 3. | 1262 | 3. | 1263 | 3. | 1264 | 3. |
| 1265 | 3. | 1266 | 3. | 1267 | 3. | 1268 | 3. | 1269 | 3. |
| 1270 | 3. | 1271 | 3. | 1272 | 3. | 1273 | 3. | 1274 | 3. |
| 1275 | 3. | 1276 | 3. | 1277 | 3. | 1278 | 3. | 1279 | 3. |
| 1280 | 3. | 1281 | 3. | 1282 | 3. | 1283 | 3. | 1284 | 3. |
| 1285 | 3. | 1286 | 3. | 1287 | 3. | 1288 | 3. | 1289 | 3. |
| 1290 | 3. | 1291 | 3. | 1292 | 3. | 1293 | 3. | 1294 | 3. |
| 1295 | 3. | 1296 | 3. | 1297 | 3. | 1298 | 3. | 1299 | 3. |
| 1300 | 3. | 1310 | 3. | 1320 | 3. | 1330 | 3. | 1340 | 3. |
| 1350 | 3. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 2. |
| 1400 | 2. | 1420 | 2. | 1440 | 2. | 1460 | 0. | 1500 | 0. |

Total Runoff = 8.735 Acre-Ft.
       Peak Q =     122 CFS
Time to Peak Q =    1153 Minutes

```
4LADEPTH.RDT
5      59     1A  LONG BEACH SPORTS PARK - 50-YEAR DISCHARGES   TALLEY REV 3/9/0
5      59    11A  END OF CALCULATION
6      59     1A  13 10     6 8A26                                    G1
6      59     2A  13 10     3 5A26
6      59     3A  13 73    310A26
6      59     4A  13 10     4 6A26
6      59     5A  13 10     3 5A26
6      59     6A  13 46     5 6A26
6      59     7A  13 10     3 5A26
6      59     8A  13 85     9 7A26
6      59     9A  14 10     3 8A26
6      59    10A  14  6     5 7A26
6      59    11A  14  1  1010A26                               1   2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

LONG BEACH SPORTS PARK - 25-YEAR DISCHARGES   TALLEY 3/19/04                                          STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 1A | 6. | 11. | 6. | 11. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 8 | A23 | 0.10 |
| 59 | 2A | 3. | 8. | 9. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A23 | 0.10 |
| 59 | 3A | 3. | 6. | 12. | 24. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 10 | A23 | 0.73 |
| 59 | 4A | 4. | 9. | 16. | 33. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A23 | 0.10 |
| 59 | 5A | 3. | 8. | 19. | 41. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A23 | 0.10 |
| 59 | 6A | 5. | 12. | 24. | 52. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A23 | 0.46 |
| 59 | 7A | 3. | 8. | 27. | 60. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A23 | 0.10 |
| 59 | 8A | 9. | 20. | 36. | 80. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 7 | A23 | 0.85 |
| 59 | 9A | 3. | 4. | 39. | 85. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 8 | A23 | 0.10 |
| 59 | 10A | 5. | 8. | 44. | 93. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 7 | A23 | 0.06 |
| 59 | 11A | 10. | 12. | 54. | 105. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 10 | A23 | 0.01 |

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

END OF CALCULATION

HYDROGRAPH AT    59   11A          STORM DAY 4          REDUCTION FACTOR = 1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|------|------|------|------|------|------|------|------|------|------|
| 0 | 0. | 100 | 2. | 200 | 2. | 300 | 2. | 400 | 2. |
| 500 | 2. | 600 | 3. | 700 | 3. | 800 | 3. | 900 | 4. |
| 1000 | 4. | 1050 | 5. | 1100 | 7. | 1110 | 9. | 1120 | 10. |
| 1130 | 13. | 1131 | 13. | 1132 | 14. | 1133 | 14. | 1134 | 15. |
| 1135 | 16. | 1136 | 16. | 1137 | 17. | 1138 | 18. | 1139 | 18. |
| 1140 | 19. | 1141 | 20. | 1142 | 21. | 1143 | 22. | 1144 | 23. |
| 1145 | 26. | 1146 | 30. | 1147 | 33. | 1148 | 36. | 1149 | 51. |
| 1150 | 65. | 1151 | 79. | 1152 | 92. | 1153 | 105. | 1154 | 102. |
| 1155 | 94. | 1156 | 82. | 1157 | 67. | 1158 | 53. | 1159 | 39. |
| 1160 | 28. | 1161 | 21. | 1162 | 15. | 1163 | 12. | 1164 | 11. |
| 1165 | 10. | 1166 | 9. | 1167 | 9. | 1168 | 8. | 1169 | 8. |
| 1170 | 8. | 1171 | 8. | 1172 | 7. | 1173 | 7. | 1174 | 7. |
| 1175 | 7. | 1176 | 7. | 1177 | 6. | 1178 | 6. | 1179 | 6. |
| 1180 | 6. | 1181 | 6. | 1182 | 6. | 1183 | 6. | 1184 | 6. |
| 1185 | 6. | 1186 | 5. | 1187 | 5. | 1188 | 5. | 1189 | 5. |
| 1190 | 5. | 1191 | 5. | 1192 | 5. | 1193 | 5. | 1194 | 5. |
| 1195 | 5. | 1196 | 5. | 1197 | 5. | 1198 | 5. | 1199 | 5. |
| 1200 | 5. | 1201 | 5. | 1202 | 5. | 1203 | 4. | 1204 | 4. |
| 1205 | 4. | 1206 | 4. | 1207 | 4. | 1208 | 4. | 1209 | 4. |
| 1210 | 4. | 1211 | 4. | 1212 | 4. | 1213 | 4. | 1214 | 4. |
| 1215 | 4. | 1216 | 4. | 1217 | 4. | 1218 | 4. | 1219 | 4. |
| 1220 | 4. | 1221 | 4. | 1222 | 4. | 1223 | 4. | 1224 | 4. |
| 1225 | 4. | 1226 | 4. | 1227 | 4. | 1228 | 4. | 1229 | 4. |
| 1230 | 4. | 1231 | 4. | 1232 | 4. | 1233 | 4. | 1234 | 4. |
| 1235 | 4. | 1236 | 3. | 1237 | 3. | 1238 | 3. | 1239 | 3. |
| 1240 | 3. | 1241 | 3. | 1242 | 3. | 1243 | 3. | 1244 | 3. |
| 1245 | 3. | 1246 | 3. | 1247 | 3. | 1248 | 3. | 1249 | 3. |
| 1250 | 3. | 1251 | 3. | 1252 | 3. | 1253 | 3. | 1254 | 3. |
| 1255 | 3. | 1256 | 3. | 1257 | 3. | 1258 | 3. | 1259 | 3. |
| 1260 | 3. | 1261 | 3. | 1262 | 3. | 1263 | 3. | 1264 | 3. |
| 1265 | 3. | 1266 | 3. | 1267 | 3. | 1268 | 3. | 1269 | 3. |
| 1270 | 3. | 1271 | 3. | 1272 | 3. | 1273 | 3. | 1274 | 3. |
| 1275 | 3. | 1276 | 3. | 1277 | 3. | 1278 | 3. | 1279 | 3. |
| 1280 | 3. | 1281 | 3. | 1282 | 3. | 1283 | 3. | 1284 | 3. |
| 1285 | 3. | 1286 | 3. | 1287 | 3. | 1288 | 3. | 1289 | 3. |
| 1290 | 3. | 1291 | 3. | 1292 | 3. | 1293 | 3. | 1294 | 3. |
| 1295 | 3. | 1296 | 3. | 1297 | 3. | 1298 | 3. | 1299 | 3. |
| 1300 | 3. | 1310 | 3. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 2. |
| 1400 | 2. | 1420 | 2. | 1440 | 2. | 1460 | 0. | 1500 | 0. |

Total Runoff = 7.552 Acre-Ft.
        Peak Q =      105 CFS
Time to Peak Q =    1153 Minutes

```
4LADEPTH.RDT
5      59      1A  LONG BEACH SPORTS PARK - 25-YEAR DISCHARGES   TALLEY 3/19/04
5      59     11A  END OF CALCULATION
6      59      1A  13 10     6 8A23                                     G1
6      59      2A  13 10     3 5A23
6      59      3A  13 73    310A23
6      59      4A  13 10     4 6A23
6      59      5A  13 10     3 5A23
6      59      6A  13 46     5 6A23
6      59      7A  13 10     3 5A23
6      59      8A  13 85     9 7A23
6      59      9A  14 10     3 8A23
6      59     10A  14  6     5 7A23
6      59     11A  14  1   1010A23                                   1   2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

LONG BEACH SPORTS PARK - 10-YEAR DISCHARGES   TALLEY 3/19/04                          STORM DAY 4

| LOCATION | | SUBAREA AREA | SUBAREA Q | TOTAL AREA | TOTAL Q | CONV TYPE | CONV LNGTH | CONV SLOPE | CONV SIZE | CONV Z | CONTROL Q | SOIL NAME | TC | RAIN ZONE | PCT IMPV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 1A | 6. | 9. | 6. | 9. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 8 | A19 | 0.10 |
| 59 | 2A | 3. | 6. | 9. | 14. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A19 | 0.10 |
| 59 | 3A | 3. | 5. | 12. | 19. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 10 | A19 | 0.73 |
| 59 | 4A | 4. | 7. | 16. | 26. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A19 | 0.10 |
| 59 | 5A | 3. | 6. | 19. | 32. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A19 | 0.10 |
| 59 | 6A | 5. | 9. | 24. | 41. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 6 | A19 | 0.46 |
| 59 | 7A | 3. | 6. | 27. | 47. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 5 | A19 | 0.10 |
| 59 | 8A | 9. | 17. | 36. | 64. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 13 | 7 | A19 | 0.85 |
| 59 | 9A | 3. | 3. | 39. | 67. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 8 | A19 | 0.10 |
| 59 | 10A | 5. | 6. | 44. | 73. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 7 | A19 | 0.06 |
| 59 | 11A | 10. | 9. | 54. | 82. | 0 | 0. | 0.00000 | 0.00 | 0.00 | 0. | 14 | 10 | A19 | 0.01 |

```
4LADEPTH.RDT
5      59      1A LONG BEACH SPORTS PARK - 10-YEAR DISCHARGES   TALLEY 3/19/04
5      59     11A END  OF CALCULATION
6      59      1A  13 10     6 8A19                                        G1
6      59      2A  13 10     3 5A19
6      59      3A  13 73    310A19
6      59      4A  13 10     4 6A19
6      59      5A  13 10     3 5A19
6      59      6A  13 46     5 6A19
6      59      7A  13 10     3 5A19
6      59      8A  13 85     9 7A19
6      59      9A  14 10     3 8A19
6      59     10A  14  6     5 7A19
6      59     11A  14  1   1010A19                                     1   2
```

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
MODIFIED RATIONAL METHOD HYDROLOGY

END OF CALCULATION

HYDROGRAPH AT     59   11A        STORM DAY 4        REDUCTION FACTOR =   1.000

| TIME | Q | TIME | Q | TIME | Q | TIME | Q | TIME | Q |
|------|------|------|------|------|------|------|------|------|------|
| 0 | 0. | 100 | 2. | 200 | 2. | 300 | 2. | 400 | 2. |
| 500 | 2. | 600 | 2. | 700 | 2. | 800 | 3. | 900 | 3. |
| 1000 | 4. | 1050 | 4. | 1100 | 6. | 1110 | 7. | 1120 | 8. |
| 1130 | 9. | 1131 | 9. | 1132 | 10. | 1133 | 10. | 1134 | 11. |
| 1135 | 11. | 1136 | 12. | 1137 | 13. | 1138 | 13. | 1139 | 14. |
| 1140 | 14. | 1141 | 16. | 1142 | 16. | 1143 | 17. | 1144 | 18. |
| 1145 | 20. | 1146 | 21. | 1147 | 23. | 1148 | 24. | 1149 | 37. |
| 1150 | 49. | 1151 | 60. | 1152 | 71. | 1153 | 82. | 1154 | 80. |
| 1155 | 73. | 1156 | 63. | 1157 | 51. | 1158 | 40. | 1159 | 28. |
| 1160 | 20. | 1161 | 14. | 1162 | 11. | 1163 | 9. | 1164 | 9. |
| 1165 | 8. | 1166 | 8. | 1167 | 7. | 1168 | 7. | 1169 | 7. |
| 1170 | 6. | 1171 | 6. | 1172 | 6. | 1173 | 6. | 1174 | 6. |
| 1175 | 6. | 1176 | 5. | 1177 | 5. | 1178 | 5. | 1179 | 5. |
| 1180 | 5. | 1181 | 5. | 1182 | 5. | 1183 | 5. | 1184 | 5. |
| 1185 | 5. | 1186 | 5. | 1187 | 5. | 1188 | 4. | 1189 | 4. |
| 1190 | 4. | 1191 | 4. | 1192 | 4. | 1193 | 4. | 1194 | 4. |
| 1195 | 4. | 1196 | 4. | 1197 | 4. | 1198 | 4. | 1199 | 4. |
| 1200 | 4. | 1201 | 4. | 1202 | 4. | 1203 | 4. | 1204 | 4. |
| 1205 | 4. | 1206 | 4. | 1207 | 4. | 1208 | 4. | 1209 | 3. |
| 1210 | 3. | 1211 | 3. | 1212 | 3. | 1213 | 3. | 1214 | 3. |
| 1215 | 3. | 1216 | 3. | 1217 | 3. | 1218 | 3. | 1219 | 3. |
| 1220 | 3. | 1221 | 3. | 1222 | 3. | 1223 | 3. | 1224 | 3. |
| 1225 | 3. | 1226 | 3. | 1227 | 3. | 1228 | 3. | 1229 | 3. |
| 1230 | 3. | 1231 | 3. | 1232 | 3. | 1233 | 3. | 1234 | 3. |
| 1235 | 3. | 1236 | 3. | 1237 | 3. | 1238 | 3. | 1239 | 3. |
| 1240 | 3. | 1241 | 3. | 1242 | 3. | 1243 | 3. | 1244 | 3. |
| 1245 | 3. | 1246 | 3. | 1247 | 3. | 1248 | 3. | 1249 | 3. |
| 1250 | 3. | 1251 | 3. | 1252 | 3. | 1253 | 3. | 1254 | 3. |
| 1255 | 3. | 1256 | 3. | 1257 | 3. | 1258 | 2. | 1259 | 3. |
| 1260 | 3. | 1261 | 3. | 1262 | 2. | 1263 | 3. | 1264 | 3. |
| 1265 | 3. | 1266 | 2. | 1267 | 2. | 1268 | 2. | 1269 | 2. |
| 1270 | 2. | 1271 | 2. | 1272 | 2. | 1273 | 2. | 1274 | 2. |
| 1275 | 2. | 1276 | 2. | 1277 | 2. | 1278 | 2. | 1279 | 2. |
| 1280 | 2. | 1281 | 2. | 1282 | 2. | 1283 | 2. | 1284 | 2. |
| 1285 | 2. | 1286 | 2. | 1287 | 2. | 1288 | 2. | 1289 | 2. |
| 1290 | 2. | 1291 | 2. | 1292 | 2. | 1293 | 2. | 1294 | 2. |
| 1295 | 2. | 1296 | 2. | 1297 | 2. | 1298 | 2. | 1299 | 2. |
| 1300 | 2. | 1310 | 2. | 1320 | 2. | 1330 | 2. | 1340 | 2. |
| 1350 | 2. | 1360 | 2. | 1370 | 2. | 1380 | 2. | 1390 | 2. |
| 1400 | 2. | 1420 | 2. | 1440 | 2. | 1460 | 0. | 1500 | 0. |

Total Runoff = 6.341 Acre-Ft.
Peak Q =      82 CFS
Time to Peak Q =   1153 Minutes

## LONG BEACH SPORTS PARK
## DETENTION BASIN VOLUME

| ELEVATION (FT) | AREA (ACRE) | AVG AREA (ACRE) | DEPTH (FT) | VOLUME (ACRE-FT) | TOTAL VOL (ACRE-FT) |
|---|---|---|---|---|---|
| 45 | 0.00 | | | | |
| | | 0.15 | 1.00 | 0.15 | 0.15 |
| 46 | 0.30 | | | | |
| | | 0.80 | 1.00 | 0.80 | 0.95 |
| 47 | 1.30 | | | | |
| | | 1.90 | 1.00 | 1.90 | 2.85 |
| 48 | 2.50 | | | | |
| | | 3.30 | 1.00 | 3.30 | 6.15 |
| 49 | 4.10 | | | | |
| | | 5.04 | 1.00 | 5.04 | 11.19 |
| 50 | 5.98 | | | | |
| | | 6.74 | 1.00 | 6.74 | 17.93 |
| 51 | 7.49 | | | | |
| | | 7.86 | 1.00 | 7.86 | 25.78 |
| 52 | 8.22 | | | | |
| | | 8.29 | 1.00 | 8.29 | 34.07 |
| 53 | 8.36 | | | | |
| | | 8.43 | 1.00 | 8.43 | 42.50 |
| 54 | 8.49 | | | | |

| YEAR STORM | PERCENTAGE | FLOW (CFS) | STORAGE VOLUME (ACRE-FT) |
|---|---|---|---|
| 50 | 1 | 620.00 | 36.07 |
| 1 | 0.4179552 | 259.13 | 15.08 |
| 2 | 0.4878198 | 302.45 | 17.60 |
| 5 | 0.5984116 | 371.02 | 21.58 |
| 10 | 0.698441 | 433.03 | 25.19 |
| 25 | 0.8567819 | 531.20 | 30.90 |

*Percentages based on L.A. County 50 Year Flow Rate

Project No.       590050
Computed By:       DT
Date:       3/8/2004

| LONG BEACH SPORTS PARK DESILTING BASIN VOLUME | | | | | |
|---|---|---|---|---|---|
| ELEVATION (FT) | AREA (ACRE) | AVG AREA (ACRE) | DEPTH (FT) | VOLUME (ACRE-FT) | TOTAL VOL (ACRE-FT) |
| 44.5 | 0.076 | | | | 0.000 |
| 45 | 0.092 | 0.84 | 0.50 | 0.042 | |
| 46 | 0.108 | 0.100 | 1.00 | 0.100 | 0.042 |
| 47 | 0.124 | 0.116 | 1.00 | 0.116 | 0.142 |
| 48 | 0.140 | 0.132 | 1.00 | 0.132 | 0.258 |
| 49 | 0.156 | 0.148 | 1.00 | 0.148 | 0.390 |
| 50 | 0.173 | 0.166 | 1.00 | 0.166 | 0.538 |
| 51 | 0.204 | 0.190 | 1.00 | 0.190 | 0.704 |
| 52 | 0.235 | 0.220 | 1.00 | 0.220 | 0.894 |
| 53 | 0.267 | 0.251 | 1.00 | 0.251 | 1.114 |
| 54 | 0.301 | 0.284 | 1.00 | 0.284 | 1.365 |

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

        LONG BEACH SPORTS PARK PROJECT

HEADING LINE NO 2 IS -

        SYSTEM '1'- 51"RCP CULVERT ACROSS DETENTION BASIN TO DESILTER

HEADING LINE NO 3 IS -

        PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP1/LBSP1Q

| CARD CODE | SECT NO | CHN TYPE | NO OF PIERS | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1 | 4 | | | 4.25 | | | | | | | | | | | | | | |
| CD | 2 | 2 | 0 | 0.00 | 6.00 | 10.00 | | | 0.00 | | | | | | | | | | |

WATER SURFACE PROFILE - ELEMENT CARD LISTING

```
ELEMENT NO   1 IS A SYSTEM OUTLET      *        *      *                                    W S ELEV
                U/S DATA   STATION   INVERT   SECT                                           51.00
                           100.00    39.59     1


ELEMENT NO   2 IS A REACH             *        *      *                                                RADIUS  ANGLE  ANG PT  MAN H
                U/S DATA   STATION   INVERT   SECT            N                                          0.00   0.00    0.00    0
                           790.00    48.98     1          0.013


ELEMENT NO   3 IS A  WALL  ENTRANCE                   *                       FP
                U/S DATA   STATION   INVERT   SECT                         0.500
                           790.00    48.98     2


ELEMENT NO   4 IS A SYSTEM HEADWORKS                  *              *                       W S ELEV
                U/S DATA   STATION   INVERT   SECT                                            0.00
                           790.00    48.98     2
```

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING
LONG BEACH SPORTS PARK PROJECT
SYSTEM '1'- 51"RCP CULVERT ACROSS DETENTION BASIN TO DESILTER
PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP1/LBSP1Q

| STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---------|-------------|---------------|-----------|---|-----|----------|----------------|------------|----------------|--|----------|--------------|-----|---------|-------|
| L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

| STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | NORM DEPTH | HGT/ DIA | BASE/ ID NO. | ZL/ZR | NO PIER | AVBPR |
|---------|-------------|---------------|-----------|---|-----|----------|----------------|------------|----------------|-----------|----------|--------------|-------|---------|-------|
| 100.00 | 39.59 | 11.410 | 51.000 | 100.0 | 7.05 | 0.772 | 51.772 | 0.00 | 2.986 | | 4.25 | 0.00 | 0.00 | 0 | 0.00 |
| 690.00 | 0.01361 | | | | | .003508 | 2.42 | | | 2.144 | | | 0.00 | | |
| 790.00 | 48.98 | 4.440 | 53.420 | 100.0 | 7.05 | 0.772 | 54.192 | 0.00 | 2.986 | | 4.25 | 0.00 | 0.00 | 0 | 0.00 |
| WALL ENTRANCE | | | | | | | | | | | | | 0.00 | | |
| 790.00 | 48.98 | 5.894 | 54.874 | 100.0 | 1.70 | 0.045 | 54.919 | 0.00 | 1.459 | | 6.00 | 10.00 | 0.00 | 0 | 0.00 |

```
100.00   .I           C       H                              W      E              .       R
114.08   .
128.16   .
142.24   .
156.33   .
170.41   .
184.49   .
198.57   .
212.65   .
226.73   .
240.82   .
254.90   .
268.98   .
283.06   .
297.14   .
311.22   .
325.31   .
339.39   .
353.47   .
367.55   .
381.63   .
395.71   .
409.80   .
423.88   .
437.96   .
452.04   .
466.12   .
480.20   .
494.29   .
508.37   .
522.45   .
536.53   .
550.61   .
564.69   .
578.78   .
592.86   .
606.94   .
621.02   .
635.10   .
649.18   .
663.27   .
677.35   .
691.43   .
705.51   .
719.59   .
733.67   .
747.76   .
761.84   .
775.92   .
790.00   .                              IYYYYYYYYYYYYYYYYYYYYCYYYYYYYYHW     E    .   WE

         39.59    41.13    42.67    44.21    45.75    47.29    48.82    50.36    51.90    53.44    54.98
```

NOTES
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

    LONG BEACH SPORTS PARK PROJECT

HEADING LINE NO 2 IS -

    SYSTEM '1'- 54"RCP CULVERT ACROSS DETENTION BASIN TO DESILTER

HEADING LINE NO 3 IS -

    PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP1A/LBSP1AQ

| CARD CODE | SECT NO | CHN TYPE | NO OF PIERS | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1 | 4 | | | 4.50 | | | | | | | | | | | | | | |
| CD | 2 | 2 | 0 | 0.00 | 6.00 | 10.00 | | | 0.00 | | | | | | | | | | |

```
100.00   .I              C       H                           W    E              .       R
114.08   .                                                                       .
128.16   .                                                                       .
142.24   .                                                                       .
156.33   .                                                                       .
170.41   .                                                                       .
184.49   .                                                                       .
198.57   .                                                                       .
212.65   .                                                                       .
226.73   .                                                                       .
240.82   .                                                                       .
254.90   .                                                                       .
268.98   .                                                                       .
283.06   .                                                                       .
297.14   .                                                                       .
311.22   .                                                                       .
325.31   .                                                                       .
339.39   .                                                                       .
353.47   .                                                                       .
367.55   .                                                                       .
381.63   .                                                                       .
395.71   .                                                                       .
409.80   .                                                                       .
423.88   .                                                                       .
437.96   .                                                                       .
452.04   .                                                                       .
466.12   .                                                                       .
480.20   .                                                                       .
494.29   .                                                                       .
508.37   .                                                                       .
522.45   ..                                                                      .
536.53   .                                                                       .
550.61   .                                                                       .
564.69   .                                                                       .
578.78   .                                                                       .
592.86   .                                                                       .
606.94   .                                                                       .
621.02   .                                                                       .
635.10   .                                                                       .
649.18   .                                                                       .
663.27   .                                                                       .
677.35   .                                                                       .
691.43   .                                                                       .
705.51   .                                                                       .
719.59   .                                                                       .
733.67   .                        I            C       X   E       .   R
747.76   .
761.84   .                        I.           C    W   H E        .   R
775.92   .                        I            C    W   HE         .   R
790.00   .                        I          C    W   X            .   R

         39.59    41.13    42.67    44.21    45.75    47.29    48.82    50.36    51.90    53.44    54.98
```

NOTES
1. GLOSSARY
     I = INVERT ELEVATION
     C = CRITICAL DEPTH
     W = WATER SURFACE ELEVATION
     H = HEIGHT OF CHANNEL
     E = ENERGY GRADE LINE
     X = CURVES CROSSING OVER
     B = BRIDGE ENTRANCE OR EXIT
     Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

       LONG BEACH SPORTS PARK PROJECT

HEADING LINE NO 2 IS -

       SYSTEM '2'- 18" RCP CULVERT ACROSS DETENTION BASIN TO AREA 1A

HEADING LINE NO 3 IS -

       PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP2A/LBSP2AQ

| CARD CODE | SECT NO | CHN TYPE | NO OF PIERS | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1 | 4 | | | 1.50 | | | | | | | | | | | | | | |
| CD | 2 | 2 | 0 | 0.00 | 3.00 | 10.00 | | | 0.00 | | | | | | | | | | |

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO   1 IS A SYSTEM OUTLET      *            *       *
                    U/S DATA   STATION    INVERT  SECT                                          W S ELEV
                               100.00     40.00    1                                            51.20


ELEMENT NO   2 IS A REACH              *            *       *
                    U/S DATA   STATION    INVERT  SECT                      N            RADIUS  ANGLE  ANG PT  MAN H
                               690.00     45.00    1                      0.013           0.00   0.00    0.00     0


ELEMENT NO   3 IS A REACH              *            *       *
                    U/S DATA   STATION    INVERT  SECT                      N            RADIUS  ANGLE  ANG PT  MAN H
                               730.00     61.00    1                      0.013           0.00   0.00    0.00     0


ELEMENT NO   4 IS A  WALL   ENTRANCE                        *
                    U/S DATA   STATION    INVERT  SECT                     FP
                               730.00     61.00    2                      0.500


ELEMENT NO   5 IS A SYSTEM HEADWORKS                        *                     *
                    U/S DATA   STATION    INVERT  SECT                                          W S ELEV
                               730.00     61.00    2                                            0.00
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

                    LONG BEACH SPORTS PARK PROJECT
                    SYSTEM '2'- 18" RCP CULVERT ACROSS DETENTION BASIN TO AREA 1A
                    PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP2A/LBSP2AQ

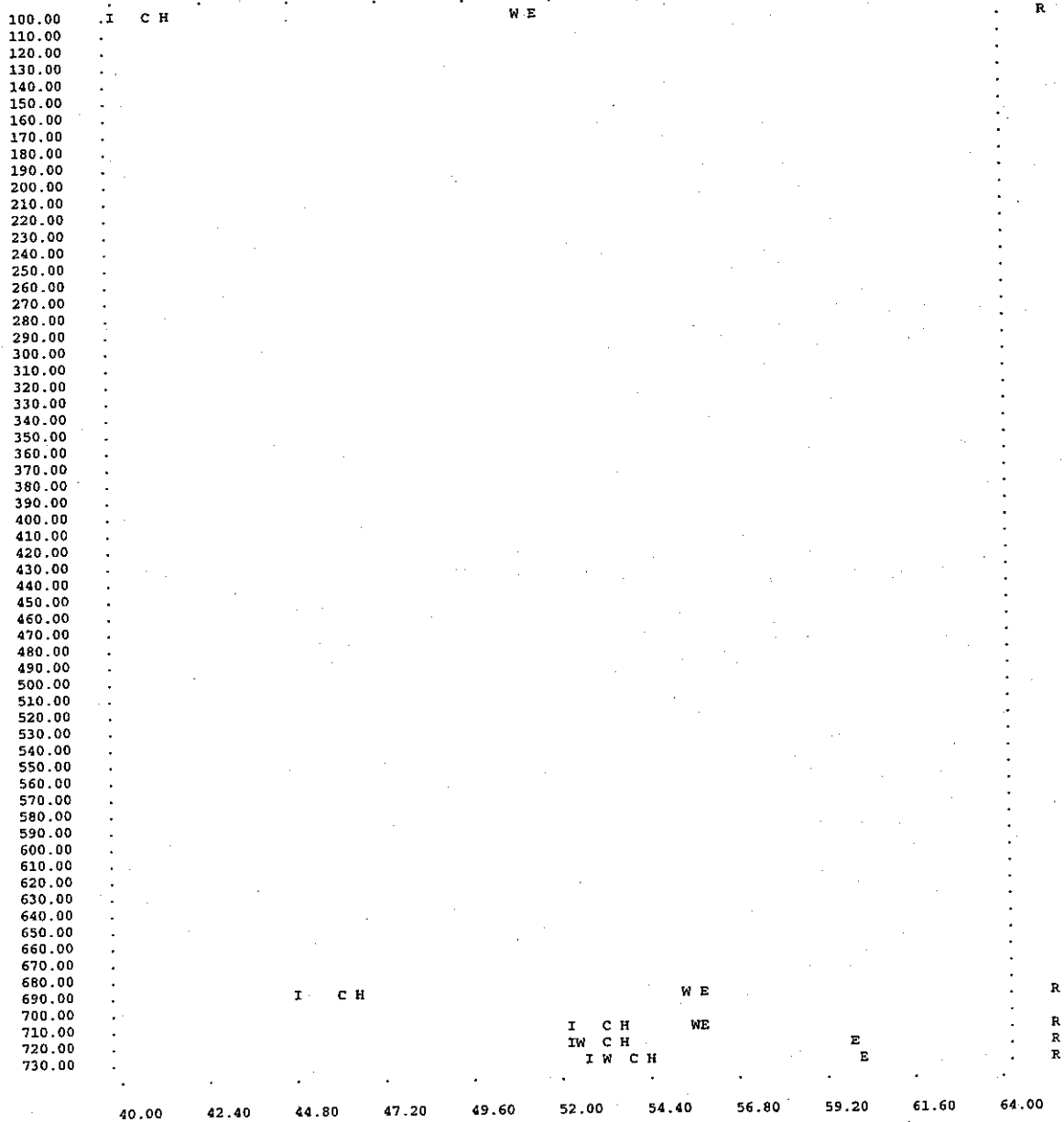| STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---------|--------|--------|--------|-----|-------|--------|--------|------|--------|--------|------|------|------|------|------|
| L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 100.00 | 40.00 | 11.200 | 51.200 | 9.0 | 5.09 | 0.403 | 51.603 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 590.00 | 0.00847 | | | | | .007341 | 4.33 | | | 1.140 | | 0.00 | | | |
| 690.00 | 45.00 | 10.531 | 55.531 | 9.0 | 5.09 | 0.403 | 55.934 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 18.14 | 0.40000 | | | | | .007341 | 0.13 | | | 0.370 | | 0.00 | | | |
| 708.14 | 52.26 | 3.415 | 55.670 | 9.0 | 5.09 | 0.403 | 56.073 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| HYDRAULIC JUMP | | | | | | | | | | | | | 0.00 | | |
| 708.14 | 52.26 | 0.428 | 52.683 | 9.0 | 21.63 | 7.268 | 59.951 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 1.63 | 0.40000 | | | | | .225804 | 0.37 | | | 0.370 | | 0.00 | | | |
| 709.77 | 52.91 | 0.434 | 53.343 | 9.0 | 21.18 | 6.963 | 60.306 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 3.18 | 0.40000 | | | | | .205351 | 0.65 | | | 0.370 | | 0.00 | | | |
| 712.95 | 54.18 | 0.449 | 54.630 | 9.0 | 20.22 | 6.352 | 60.982 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 2.55 | 0.40000 | | | | | .179792 | 0.46 | | | 0.370 | | 0.00 | | | |
| 715.50 | 55.20 | 0.465 | 55.663 | 9.0 | 19.27 | 5.767 | 61.430 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 2.09 | 0.40000 | | | | | .157436 | 0.33 | | | 0.370 | | 0.00 | | | |
| 717.59 | 56.03 | 0.481 | 56.516 | 9.0 | 18.37 | 5.239 | 61.755 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 1.75 | 0.40000 | | | | | .137858 | 0.24 | | | 0.370 | | 0.00 | | | |
| 719.34 | 56.74 | 0.498 | 57.234 | 9.0 | 17.51 | 4.761 | 61.995 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 1.49 | 0.40000 | | | | | .120812 | 0.18 | | | 0.370 | | 0.00 | | | |
| 720.83 | 57.33 | 0.516 | 57.846 | 9.0 | 16.70 | 4.329 | 62.175 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 1.27 | 0.40000 | | | | | .105877 | 0.13 | | | 0.370 | | 0.00 | | | |
| 722.10 | 57.84 | 0.534 | 58.375 | 9.0 | 15.93 | 3.940 | 62.315 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 1.11 | 0.40000 | | | | | .092782 | 0.10 | | | 0.370 | | 0.00 | | | |

WATER SURFACE PROFILE LISTING
LONG BEACH SPORTS PARK PROJECT
SYSTEM '2'- 18" RCP CULVERT ACROSS DETENTION BASIN TO AREA 1A
PRELIMINARY HYDRAULICS    TALLEY   8/9/04 FILES: LBSP2A/LBSP2AQ

| STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 723.21 | 58.28 | 0.553 | 58.835 | 9.0 | 15.18 | 3.577 | 62.412 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.95 | 0.40000 | | | | | .081361 | 0.08 | | | 0.370 | | | 0.00 | | |
| 724.16 | 58.66 | 0.573 | 59.238 | 9.0 | 14.47 | 3.251 | 62.489 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.84 | 0.40000 | | | | | .071390 | 0.06 | | | 0.370 | | | 0.00 | | |
| 725.00 | 59.00 | 0.594 | 59.594 | 9.0 | 13.80 | 2.959 | 62.553 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.73 | 0.40000 | | | | | .062676 | 0.05 | | | 0.370 | | | 0.00 | | |
| 725.73 | 59.29 | 0.616 | 59.908 | 9.0 | 13.16 | 2.688 | 62.596 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.65 | 0.40000 | | | | | .055023 | 0.04 | | | 0.370 | | | 0.00 | | |
| 726.38 | 59.55 | 0.638 | 60.188 | 9.0 | 12.55 | 2.447 | 62.635 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.56 | 0.40000 | | | | | .048323 | 0.03 | | | 0.370 | | | 0.00 | | |
| 726.94 | 59.77 | 0.662 | 60.437 | 9.0 | 11.97 | 2.224 | 62.661 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.49 | 0.40000 | | | | | .042488 | 0.02 | | | 0.370 | | | 0.00 | | |
| 727.43 | 59.97 | 0.687 | 60.660 | 9.0 | 11.41 | 2.020 | 62.680 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.44 | 0.40000 | | | | | .037353 | 0.02 | | | 0.370 | | | 0.00 | | |
| 727.87 | 60.15 | 0.712 | 60.860 | 9.0 | 10.87 | 1.835 | 62.695 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.38 | 0.40000 | | | | | .032850 | 0.01 | | | 0.370 | | | 0.00 | | |
| 728.25 | 60.30 | 0.739 | 61.040 | 9.0 | 10.37 | 1.669 | 62.709 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.33 | 0.40000 | | | | | .028918 | 0.01 | | | 0.370 | | | 0.00 | | |
| 728.58 | 60.43 | 0.767 | 61.201 | 9.0 | 9.88 | 1.516 | 62.717 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.29 | 0.40000 | | | | | .025481 | 0.01 | | | 0.370 | | | 0.00 | | |
| 728.87 | 60.55 | 0.797 | 61.346 | 9.0 | 9.42 | 1.379 | 62.725 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.25 | 0.40000 | | | | | .022474 | 0.01 | | | 0.370 | | | 0.00 | | |

WATER SURFACE PROFILE LISTING
LONG BEACH SPORTS PARK PROJECT
SYSTEM '2'- 18" RCP CULVERT ACROSS DETENTION BASIN TO AREA 1A
PRELIMINARY HYDRAULICS    TALLEY  8/9/04 FILES: LBSP2A/LBSP2AQ

| STATION | INVERT ELEV | DEPTH OF FLOW | W.S. ELEV | Q | VEL | VEL HEAD | ENERGY GRD.EL. | SUPER ELEV | CRITICAL DEPTH | | HGT/ DIA | BASE/ ID NO. | ZL | NO PIER | AVBPR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/ELEM | SO | | | | | SF AVE | HF | | | NORM DEPTH | | | ZR | | |
| 729.12 | 60.65 | 0.828 | 61.477 | 9.0 | 8.98 | 1.253 | 62.730 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.22 | 0.40000 | | | | | .019838 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.34 | 60.73 | 0.861 | 61.595 | 9.0 | 8.57 | 1.141 | 62.736 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.18 | 0.40000 | | | | | .017536 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.52 | 60.81 | 0.896 | 61.702 | 9.0 | 8.17 | 1.036 | 62.738 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.14 | 0.40000 | | | | | .015523 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.66 | 60.87 | 0.933 | 61.799 | 9.0 | 7.79 | 0.943 | 62.742 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.13 | 0.40000 | | | | | .013760 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.79 | 60.91 | 0.972 | 61.886 | 9.0 | 7.43 | 0.856 | 62.742 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.09 | 0.40000 | | | | | .012214 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.88 | 60.95 | 1.013 | 61.965 | 9.0 | 7.08 | 0.779 | 62.744 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.07 | 0.40000 | | | | | .010870 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.95 | 60.98 | 1.058 | 62.037 | 9.0 | 6.75 | 0.708 | 62.745 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.04 | 0.40000 | | | | | .009709 | 0.00 | | | 0.370 | | | 0.00 | | |
| 729.99 | 60.99 | 1.107 | 62.101 | 9.0 | 6.44 | 0.644 | 62.745 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| 0.01 | 0.40000 | | | | | .008699 | 0.00 | | | 0.370 | | | 0.00 | | |
| 730.00 | 61.00 | 1.161 | 62.161 | 9.0 | 6.13 | 0.584 | 62.745 | 0.00 | 1.161 | | 1.50 | 0.00 | 0.00 | 0 | 0.00 |
| WALL ENTRANCE | | | | | | | | | | | | | 0.00 | | |
| 730.00 | 61.00 | 2.149 | 63.149 | 9.0 | 0.42 | 0.003 | 63.152 | 0.00 | 0.293 | | 3.00 | 10.00 | 0.00 | 0 | 0.00 |

LONG BEACH SPORTS PARK PROJECT
SYSTEM '2'- 18" RCP CULVERT ACROSS DETENTION BASIN TO AREA 1A
PRELIMINARY HYDRAULICS   TALLEY  8/9/04 FILES: LBSP2A/LBSP2AQ

```
100.00   .I   C H                          W E                              R
110.00   .
120.00   .
130.00   . .
140.00   .
150.00   .
160.00   .
170.00   .
180.00   .
190.00   . .
200.00   .
210.00   .
220.00   .
230.00   .
240.00   .
250.00   .
260.00   .
270.00   .
280.00   .
290.00   .
300.00   .
310.00   .
320.00   .
330.00   .
340.00   .
350.00   .
360.00   .
370.00   .
380.00   .
390.00   .
400.00   .
410.00   .
420.00   .
430.00   .
440.00   .
450.00   .
460.00   .
470.00   .
480.00   .
490.00   .
500.00   .
510.00   . .
520.00   .
530.00   .
540.00   .
550.00   .
560.00   .
570.00   .
580.00   .
590.00   .
600.00   .
610.00   .
620.00   .
630.00   .
640.00   .
650.00   .
660.00   .
670.00   .
680.00   .
690.00   .          I    C H                       W E              .  R
700.00   .
710.00   .                         I    C H      WE                 .  R
720.00   .                         IW   C H              E           .  R
730.00   .                          I W  C H             E              R

         40.00   42.40   44.80   47.20   49.60   52.00   54.40   56.80   59.20   61.60   64.00
```

N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY

# APPENDIX C

# REFERENCE MATERIALS

April 30, 1992


TO:      Richard J. Smith
         Design Division

FROM:    Donald F. Nichols
         Hydraulic/Water Conservation Division

## LOS ANGELES RIVER
## WALNUT SPRING DRAIN AND DETENTION BASIN - HYDROLOGY
## FILE NO. 676.41

This confirms the discussion with Ray Hashima and Bob Woo by the undersigned on April 16, 1992 in response to your request. The subject project entails a drain and a detention basin. It will be constructed as part of the City of Long Beach Redevelopment Plan of the area. The Basin and Project Drain 5109 will provide outlet to runoff from design level storms in the Walnut Spring Watershed. This transmittal ammends our previous report dated July 8, 1986, File No. 676.41


## Attachments

A. Hydrologic map showing proposed and existing drain alignments and drainage area boundaries.

B. Hydrologic data sheets listing subarea sizes and subarea and reach peak flow rates.

C. Supporting information including design parameters, scaledown factor, flooding analysis, mandatory flood insurance requirenents, and references.

## Summary of Findings

A. The proposed alignment shown in Attachment A represents the best hydrologic solution for the flooding problem as we understand it and may not necessarily correspond with the exact alignment proposed in the request.

B. The peak inflow rate for the proposed basin is 620 cfs.

C. There is no scale-down factor.

D. Construction of the detention basin for 36.07 acre-feet volume as proposed will provide protection from a 50-year frequency rainfall.

ATTACHMENT A                    Sheet 1 of 1



*AS PER REVISED
HYDROLOGY STUDY
DATED JULY 6, 1988.

⟶* FLOWS UP TO 100 CFS WILL FLOW
TO DRAIN 5109 ? REMAINING FLOWS
COMBINED WITH DIRECT RAINFALL 'VER'
BASIN TOTALING 56.07ACRE-FT VOLUME
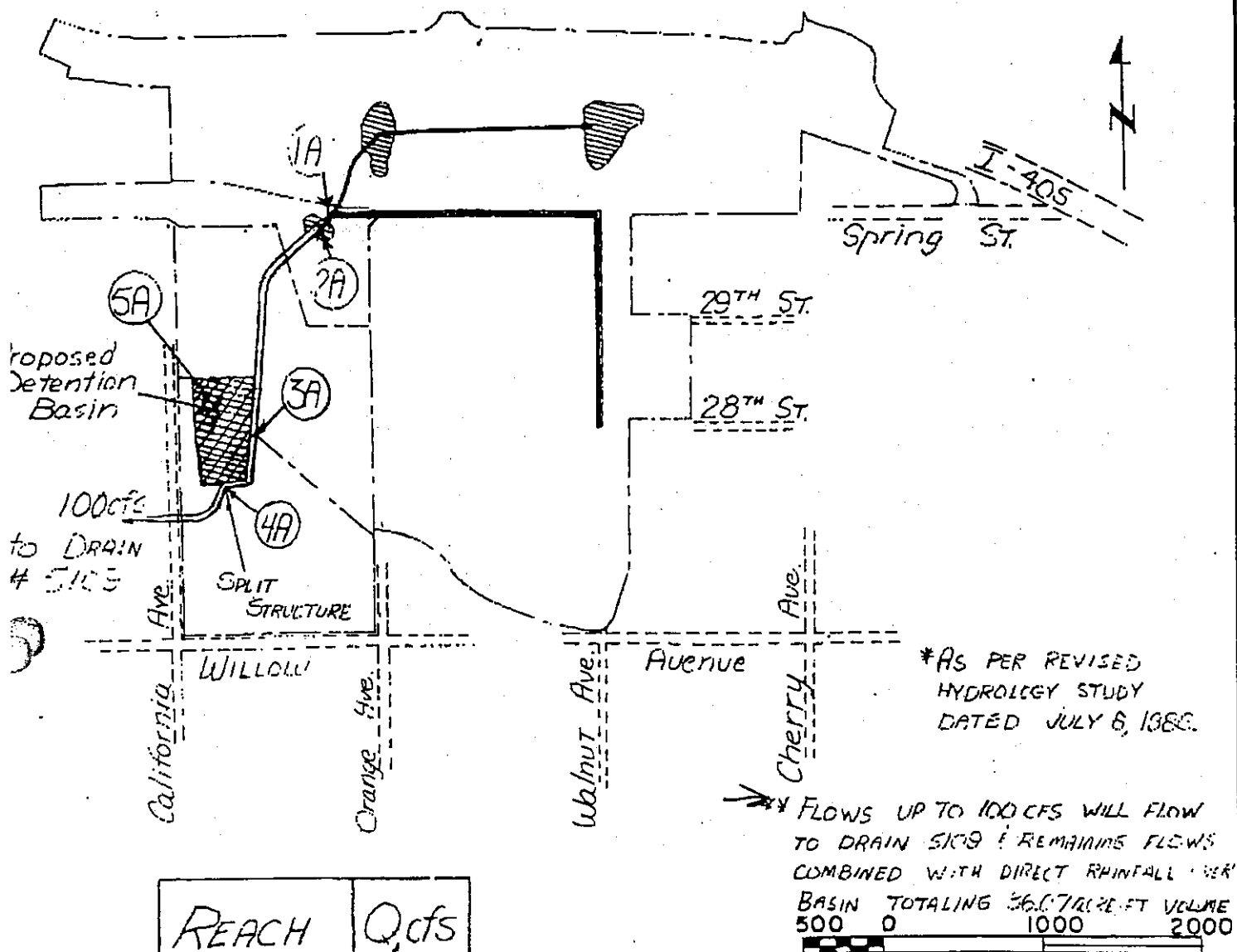
| REACH | Q, cfs |
|---|---|
| 1A - 2A | 460* |
| 2A - 3A | 500 |
| 3A - 4A | 560 |
| 4A - SPLIT | 620 |
| SPLIT - 5A | 520 |
| 5A - BASIN | 550** |
| SPLIT - Proj 5109 | 100** |

## LEGEND

— · — · — WATERSHED BOUNDARY
════════ PROJECT DRAIN
──────── EXISTING DRAIN
◯──⟶ SUBAREA AND COLLECTION POINT
·········· PROBABLE FUTURE DRAIN
══════ STREETS
SUMP

| PREPARED | LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS |
|---|---|
| J. Jacobson | Los Angeles River |
| DATE 4-15-92 | Walnut Spring Drain |
| SCALE 1" = 1000' | 50-Yr Frequency Rainfall |

QUAD : Long Beach (1-H15)

# ATTACHMENT B
# HYDROLOGIC DATA

Walnut Spring Drain

yance Types
. Natural Mountain
. Natural Valley
. Street

4. Pipe
5. Rectangular Channel
6. Trapezoidal Channel

## 50-Year Frequency Rainfall

| Reach or subarea | Preliminary Conveyance | | | Slope | Area (acres) | | Peak Q (cfs) | |
|---|---|---|---|---|---|---|---|---|
| | Length (feet) | Type | Size (feet) | | Subarea | Total | Subarea[1] | Reach[2] |
| INE A | | | | | | | | |
| 1A | | | | | 207 | | 460 | |
| A - 2A | - | - | - | .. | | 207 | | 460 |
| 2A | | | | | 17 | | 40 | |
| A - 3A | 1200 | 4 | 6.00' | 0.02080 | | 224 | | 500 |
| 3A | | | | | 32 | | 110 | |
| 3A - 4A | 450 | 4 | 8.00' | 0.00330 | | 256 | | 560 |
| 4A | | | | | 28 | | 75 | |
| 4A-Split | - | - | - | - | | 282 | | 620[3] |
| Split-5A | | | | | | 237 | | 520 |
| 5A | | | | | 6 | | 25 | |
| -Bsn(Tot.) | | | | | | 245 | | 530 |
| Split-5109 | | | | | | | | 100 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

flow rate from the subarea that can be proportioned (Q/A) for catch basin design within the subarea the Department's "Design Manual--Hydraulic").

ak flow rate at the top of the reach for design of the conveyance.

e peak inflow hydrograph is split on a truncation basis whereby all flows up to 100 cfs continue to flow the drain and the remaining flow will be transferred for storage in the basin.

Los Angeles County Department of Public W ...s    Sheet 1 of 1

## ATTACHMENT C

## SUPPORTING INFORMATION

Project:    Walnut Spring Drain

### Design Parameters

This hydrology meets the policies and procedures established in the Department of Public Works hydrology manual dated December 1991.

The total watershed size is 290 acres. The assumed ultimate development in the watershed is 93 % commercial, 7 % cemetery or other.

All reported flow rates are adequately collected runoff from a 50-year frequency rainfall.

Adequate collection assumes that the drainage system collects all incoming surface flows and that runoff will flow out of its appropriate subarea only at the collection point.

### Scale-down Factor

The outlet drain flows into Project Drain No. 5109, which has capacity to receive 100 cfs.

### Flood Insurance

The watershed is not in a mandatory flood insurance zone.

**FULL SIZE EXISTING HYDROLOGY EXHIBIT IS**


**AVAILABLE FOR REVIEW AT THE CITY OF LONG BEACH**


**COMMUNITY DEVELOPMENT DEPARTMENT**

**FULL SIZE PROPOSED ON-SITE HYDROLOGY EXHIBIT IS**


**AVAILABLE FOR REVIEW AT THE CITY OF LONG BEACH**


**COMMUNITY DEVELOPMENT DEPARTMENT**